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ScienceDirect

Procedia - Social and Behavioral Sciences 191 (2015) 1690 – 1692

Procedia
Social and Behavioral Sciences

WCES 2014

Optimization Model Of Interactive Forms Of Education For Formation Innovative And Research Competence

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Abstract

Formation innovative and research competence is the result of the introduction of interactive forms of education. What is the combination of these form for the best result? Solve the optimization problem of the educational process for the best formation innovative and research competence. Used in the research system analysis, survey, mathematic modeling, regression analysis, linear programming In this paper is the definition of innovative and research competence future engineers. The optimal combination of interactive forms is solution of the optimization problem in MS EXCEL. Innovative and research competence of future engineers will be best, if there is combination of the interactive forms: brain storm – 10%, imitating training – 10%, didactic game – 10%, technologies projects – 40%, information and computer technologies – 20%, case-stadi – 10%, laboratory research workshop – 20% . Then at xi restrictions ≥ the minimum value, applying a simplex method of the solution of problems of linear programming, using the "decision search" tool, we receive optimum distribution for the educational innovations necessary for the maximum formation of innovative and research competence.

Selection and peer-review under responsibility of the Organizing Committee of WCES 2014

Keywords: innovative capacity of higher education institution, innovative and research competence, educational innovations, methods of economic-mathematical modeling, management of innovations

1. Main text

The current state of innovative activity in Russia depends on use of innovative potential of higher educational institutions. As Shevchenko and Kaplan (2013) "a basis of formation of innovative potential of a higher educational

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Selection and peer-review under responsibility of the Organizing Committee of WCES 2014
doi:10.1016/j.sbspro.2015.04.663

institution note in the article harmonious functioning of system of the higher school which represents the organization of subjects and the objects of innovative activity interacting in the course of creation of innovations on the uniform organizational principles, defined by strategy of innovative development of the unuversity". Quality assumes not so much satisfaction to standards, how many, whether this production could anticipate expectation of consumers. Therefore quality of the higher education, in our opinion, is defined by as far as the university graduate in some years is demanded by economy and society as far as he is competitive. The economic situation in Russia and in the world, the politician of modernization and innovations predetermines need of training of university graduates ready and capable to innovative activity. New requirements to training define need of revision of forms, methods, the maintenance of the higher education. The modern educational paradigm assumes higher education institution transition to more praktiko-focused system of training. Implementation of Federal state educational standards of the third generation predetermined the purpose of training in higher education institution - formation of a certain set of the competences providing readiness to these or those a kind of activity. Thus process of teaching will be transformed to management of activity on acquisition (formation) of competences. It is well-known that any management is based on interrelation of the following main functions: planning, organization, motivation and control. We will consider consistently these stages. When planning educational activity it is necessary to carry out the analysis internal and higher education institution environment, having established thus the reasons of gaps between predicted result of education in the future and received result at the present stage. These gaps can be overcome by means of introduction of educational innovations in forms, methods, the contents, technologies. If to speak about a current state of higher education institutions, a characteristic problem for the majority of them is formation and development of innovative potential. Innovative capacity of higher education institution depends on activity of participants of innovative process: teachers, graduate students, undergraduates, students of older years. There is a question: what properties of the personality to have the student for readiness for innovative engineering activity. In the article "Model of Engineering Preparation and Educational Standards of New Generation" Sosnin and Pochekutov, (2009) give the following definition of innovative engineering activity: "Innovative engineering activity is a development and creation of new equipment and technologies, finishing to a type of the products providing new social and economic effect" . For an intensification of innovative process in higher education institution they need to possess innovative and research competence. Ponomarchuk, (2009) defines research competence as total readiness of the graduate for the research professional activity connected with in detail and purposefully made receiving new knowledge. At the higher vocational school for successful conducting innovative activity it isn't enough to have only research competence, or only innovative competence, it is necessary to be able not receive new knowledge or to master it, but also to bring the created product to a type of goods which will give both social, and economic effect. It is necessary to possess a certain economic knowledge, ability to the enterprise risk, the developed communicative qualities. We also will call a combination of all these properties innovative and research competence – readiness of the university graduate for research activity for creation of a new product and technology, and also readiness for further introduction of this product in production or social activity for the purpose of receiving new social or economic effect. Essential factor of development of innovative potential is formation of innovative and research competence of students who already on older years of higher education institution and in a magistracy with success can be involved in innovative activity of higher education institution. Formation of such competence process many-sided, difficult. Application in the course of training of innovative organizational forms is necessary. As it was already noted earlier, the modern competence-based paradigm defined change of a role of the teacher in educational process. The role of "transmitter", "translator" of a certain knowledge faded into the background. Today a task of the teacher - the effective management of knowledge acquisition, management of educational activity of the student. Management has four main functions: "planning", "organization", "motivation" and "control". Thus, we come to a solution of the problem of development of innovative capacity of higher education institution by means of formation of innovative and research competence at being trained as a result of optimization of innovative and educational activity. Function of optimization is level of formation of innovative and research competence. Such competence can be created by means of the following educational innovations: "seminar debate", "educational discussion", "brain storm", "imitating training" , didactic game, technologies of design training, information and computer technologies of training, decision case-stadi. It is obvious that for the different directions of preparation their optimum combination will differ. We suggested teachers to estimate on a 10-ball scale of the opportunity, taught discipline in the developed innovative organizational forms in development of innovative and research competence. Distribution of hours (in %), allocated on practical, laboratory and seminar

occupation (on the average 36 hours) was analyzed. We will apply a method of the regression analysis in MS EXCEL. Function characterizing change of formation of innovative and research competence:

F = X2-0,03 X5-0,04 X6+0,08 X6+0,08 X7+8,67

Then at xi restrictions ≥ the minimum value, applying a simplex method of the solution of problems of linear programming, using the "decision search" tool, we receive optimum distribution for educational innovations:

Table 1. Distribution (in %) educational innovations by preparation in the direction "information systems and technologies"

	educational innovations	%
1	Educational discussion	
2	"Brain storm"	10
3	Imitating training	10
4	Didactic game	10
5	Technologies of design training	40
6	Information and computer technologies of training	20
7	Decision case-stady	10
8	Laboratory and research practical work	20

At such distribution the maximum value of formation of innovative and research competence will be approximate equally 7,6. The conducted research shows about need of more detailed approach to formation of innovative and research competence by means of introduction of active and interactive forms of education, and also application opportunities thus methods of economic-mathematical modeling. However, it is obvious that one change of organizational forms of education such competence fully won't manage to be created. It is necessary to enter into preparation in all directions and an innovation in the contents, namely, course "enterprise right" studying, and also disciplines "the complex analysis of financial and economic activity" as the knowledge of these disciplines will help to introduce the developed innovations in national economy. The innovative and research competence of students of older years created thus and undergraduates becomes, in our opinion, a powerful contribution to development of innovative capacity of higher education institution.

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